DRIVER ALARM

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates in general to safety devices, and in particular to driver alertness monitors that alert the driver to the onset of fatigue and drowsiness.

2. Description of the Related Art

There are many devices in existence to alert drivers when they begin to fall asleep while operating a vehicle. Some have devices that attach to the driver's head for detecting when the driver's head begins to nod. These devices can have the unintended effect of causing neck and back fatigue, because drivers tend to hold their heads rigidly to prevent accidently triggering the alarm. Also, many drivers are unwilling to inconvenience themselves with putting on and wearing the devices. Other devices monitor minute movement of the steering wheel to determine whether the driver is alert and reacting to the environment. These devices are comparatively slow to detect a hazardous condition and often give false alarms.

Another class of device requires the driver to grip a device, either fastened around the steering wheel or held in the hand. U.S. Pat. No. 4,540,979, issued to Gerger et al., on Sep. 10, 1985, discloses a structure employing an air tube fastened around the circumference of the steering wheel. The tube is capped at one end and hermetically sealed to a pressure switch at the other end. The switch operates an alarm mechanism. The wheel must be gripped with sufficient force to actuate the pressure switch and silence the alarm. This device, and others like it, can also cause driver fatigue, as many drivers will grip the switch with excessive force in order to prevent the alarm from sounding.

A need remained for a driver alarm that is unobtrusive and convenient to use. A need also remained for a driver alarm that can respond rapidly, while still being sensitive to slow changes in driving conditions. A driver alarm that adapts itself to different drivers' gripping pressures was also desired. As always, a driver alarm that is reliable and less expensive was also desired.

SUMMARY OF THE INVENTION

The general object of the invention is to alert a driver when the device determines that the driver is becoming dangerously drowsy. This object is achieved by a variable pressure transducer attached to the steering wheel on the vehicle, a control unit, a speed sensor, and an alarm mechanism. The pressure transducer produces an electrical signal corresponding to the hand grip pressure on the wheel. The control monitors this signal and determines if a hazardous condition exists. If there is a hazardous condition, the control unit activates the alarm mechanism, which can produce an audible alarm, a mechanical vibration, or any of the other responses already used in the art. A speed sensor is used to suspend operation of the alarm until the speed of the vehicle is above a preset threshold.

Other objects of the invention are that it operate with a minimum of interference to the driver, and that it should not compel the driver to grip the wheel with unusual force. These objects are achieved by use of the variable pressure transducer. Since there is no set amount of pressure that must be applied, as in the case of a switch, there is less incentive for the driver to grip the wheel excessively hard, thus preventing fatigue. The transducer is mounted on the normal gripping area on the steering wheel and does not require any change to driving style, so interference to driving is minimized.

Still another object is to adapt to the different grip pressures of different drivers. This object is also achieved by use of the variable pressure transducer. By monitoring a variable pressure signal instead of a discrete switch point, the driver alarm may be adjusted to each driver's particular grip pressure.

Another object is that the invention respond rapidly to dangerous conditions, while also having the capability to respond to a slow deterioration of driving response. This object is achieved by the way in which the control unit monitors the pressure signal. If the signal falls below a minimum threshold, the control unit rapidly activates the alarm. The control unit can also monitor the normal variations in the pressure signal that occur as an alert driver responds to driving conditions. If these variations change substantially over time, the control unit can alert the driver.

The above, as well as additional objects, features, and advantages of the invention will become apparent in the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a driver alarm according to the invention, as it appears when installed.

FIG. **2** is a cross sectional view thereof, as seen along lines **2**—**2** in FIG. **1**.

FIG. **3** is a block schematic view of the functional elements of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. **1** shows the preferred embodiment of the driver alarm **11**—of the invention as installed in an automobile **13**. The driver alarm **11** includes a pressure transducer **15** adapted to fit around the steering element, in this case a steering wheel **17**. The transducer **15** could be designed to fit along the gripping surface of a motorcycle handlebar or other steering element as well. The transducer **15** is attached by clips **18** that do not compress the transducer **15**. If the driver alarm **11** is incorporated into the vehicle as part of the original equipment, the transducer **15** could be partially inset into a channel (not shown) with integral retainers formed in the steering wheel **17**.

The pressure transducer **15** is shown in cross section in FIG. **2**. A center conductor **19** is surrounded by a compressible conductive foam **21**. The foam **21** is made from the same material used to protect static-sensitive electronic components during transport. Surrounding the foam **21** is a flexible conductive shield **23** made in a manner known in the art for coaxial cable. A flexible, waterproof outer cover **25** protects and contains the other elements. While a coaxial configuration of the elements is shown, other configurations are possible, such as flat strip having two parallel conductors separated by a layer of the conductive foam **21**.

Compressing the foam **21** causes the resistance of the foam **21** between the points of compression to decrease. The electrical resistance of the transducer **15**, as measured between the center conductor **19** and the conductive shield **23**, will therefore vary with the amount by which the transducer **15** is compressed. The total change in resistance will in turn depend on both the magnitude of the pressure and the percentage of the total length of the transducer **15**